Ticks and Lyme Disease

Iain B.McIntosh BA(Hons) MBChB. FFTM RCPS(Glas)

Fourteen different tick-borne diseases have been reported in international travellers. In most cases and in Britain this is usually Lyme borreliosis, caused by *Borrelia burgdorferi* sensu lato in North America and Eurasia. African tick bite fever is caused by *Rickettsia africae* in sub-Saharan Africa and eastern Caribbean, and Central European encephalitis is caused by tick-borne encephalitis virus in Europe. Tick bites and infection are becoming common in many parts of Britain, with Hampshire the worst affected area in England.

Ticks are even moving into Scottish urban areas due to milder winters and a burgeoning deer population. Contact with tick parasites used to be a hazard affecting only rural dwellers, but global warming, and an increase in countryside walking has ensured that many people are being bitten by ticks. According to the Health Protection Agency there were 768 cases of Lyme disease reported in Britain in 2007compared with 292 in 2003, a rise of 265%.(Table One)There are many unreported cases each year as it is not a notifiable disease. It may be expected that, with warmer year-round temperatures, the UK will see more cases of Lyme disease nearly half of these Lyme disease cases are diagnosed in the months of August and September when people spend more time in gardens or visiting parks and areas where ticks are present. With the increasing popularity of ecotourism and adventure travel worldwide, the incidence of travel-associated tick-borne diseases is likely to increase in the future

The Cause of Lyme Disease
Lyme disease is caused by a bacterium which is spread by ticks (Ixodes ricinus) and is associated with warm weather, the countryside, parks and gardens where people can come into contact with the infected tick. The clinical presentation is frequently non-specific, and tick-borne diseases should always, in the absence of other likely diagnoses, be suspected in travellers with flu-like symptoms following a recent visit to tick-infested areas. About 10% of cases involve the more serious symptoms of arthritis and 5% experience facial paralysis, in addition to the skin rash that is characteristic of the disease. There are no human vaccines although antibiotics can be successfully used in treatment.

Doctors and nurses are failing to identify the bites, the health risk and to institute appropriate therapy. These tiny blood suckers can transmit several diseases to humans with resultant morbidity and fatality. People of all ages are now venturing into forests, hills and countryside, the habitat of deer and sheep. Walkers and ramblers after strolling footpaths, treescape and parkland, are reporting, in increasing number to family doctors and A&E units, after being bitten. Some present after the tick has fallen off the skin with a pathognomonic circular inflamed skin lesion, or with a skin rash of unknown origin which goes undiagnosed, but can be traced back to a tick bite.

What is a tick?

A tick is not an insect, but an arachnid. Like a spider, it has eight legs, (some only have six at certain stages of development).They feed on the blood of animals and birds. Nymphal and adult deer ticks can be carriers of Lyme disease. Nymphs are about the size of a poppy seed. The tick life cycle requires in the first year, a rodent host, with rodents increasing in number following warmer winters, leading to more opportunities for tick-host contact. Extremely hot dry weather, however, is believed to put a check on tick populations because the insect needs moist conditions to survive.

Ticks have a harpoon-like structure near the mouth area which allows them to dig into the host's skin while feeding. This harpoon-like structure has barbs which anchor in the skin, the reason why ticks are difficult to remove. They live in the soil and emerge to climb tall grass, shrubs, bushes and low level tree branches up to a height of 20cm-70cm, in search of a blood host. They attach to people, or animals as they brush past and look for an area of soft skin to insert their feeding organ and suck blood, which is when disease is transmitted.
Ticks can attach themselves almost anywhere on the body, but prefer creases like the armpit, groin and back of the knee. Victims do not feel the bite because the tick also injects a toxin that anaesthetises the bite area.

Who may get bitten?
The victim may not associate later symptoms with a bite. Many health professionals fail to consider tick bite infection in differential diagnosis, do not institute early investigation and miss the opportunity for prompt treatment and prevention of serious sequelae. Across Britain and near Europe, outdoor enthusiasts, hill-walkers, off- road cyclists, campers and even those having a rural picnic, or tending an urban garden, are at risk. Health professional advice to participate in active outdoor exercise is encouraging people to take up outdoor pursuits at a time when there has been an explosive increase in the tick population.

Formerly a summer time hazard in deer populated districts, the ticks' geographic habitat has expanded and with more mild, damp winters they survive and may bite through the whole year. They inhabit rural grass, shrub and forest areas and pastures of grazing deer. With climatic change ticks are remaining active all year round and are a major problem in endemic areas worldwide. Scotland's border hills and Highlands, the Lake District and forest areas of England and Wales also attract the tourist and the tick. Ticks need a sheltered environment to survive frost and wind. High deer populations and a large increase in ramblers and hill walkers now place many at serious risk of multiple bites in country walks.

Ticks are external parasites and there are about 850 tick species with 80 of medically importance. They transmit at least 14 viral, bacterial and protozoan infections to man and can cause Lyme disease, tick-borne encephalitis and relapsing fever. They come second to mosquitoes as vectors of disease in man[i] There are two types of tick:

Hard Ticks
Hard ticks(Ixodidae) have a hard outer shell and a 3 cycle life stage of larva, nymph and adult. From egg to death of the adult can take up to three years.. Larva and nymph are smaller than a pinhead with the latter usually feeding on deer or sheep. Unfed adults are almost invisible on the human skin .After a full feed; they are up to 10mm in size, when blood makes then visible as black specks which cannot be easily

dislodged from their skin hold. They feed only once in each stage with feeding engorging the tick up to 600 times its unfed body weight. The feeding process may take up to three to six days to complete, starting 4-24 hours [ii] after attachment of tick to skin. There is an opportunity to prevent feeding and disease by dislodgement of the tick in this period. Unfortunately the unwilling host may be unaware of the bite as the parasites secrete anticoagulant, antinflamatory compounds and immuno suppressive material so that the bite remains unnoticed. On the last day of feeding, a large amount of blood is taken (the big sip). Heat, carbon dioxide and body movement attract ticks, as they perch on the end of leaves and grass,. Actual host contact is required as they do not jump a gap and the transmission season is mainly April to October in Britain,

Soft ticks

Argasidae are soft skinned and less medically important. They feed for shorter intervals but have multiple feeds, are more resistant to climate change and survive for years without a meal.

Lyme Disease

Designated after the town of Lyme in Connecticut USA[iii] where cases of arthritis were found to have an infective source from a spirochaete, Borrellia burgdorferi with the vector a tick. About 25% ticks carry infection .[iv] .

Presentation. An itchy spot identifies the site of attachment, on usually thighs, torso or chest but they also like moist private parts .The lesion is often ignored by the inflicted other than for scratching which does not dislodge the tick. The characteristic presentation to doctor or nurse is erythema migrans, a circular area round the bite some days after the tick has fallen off or been removed. It will gradually grow bigger, with a pale area in the middle. Erythema migrans can also appear at other places on the body where the tick has not bitten. Some people get many red spots. Usually one to four weeks will pass between the bite and when erythema migrans appears. Eythema migrans is the hallmark presentation for early localized infection with *Borrelia burgdorferi*. The ability of patients to remember a tick bite varies, as some bites are more painful than others. Early localized disease typically begins as a localized erythema migrans rash or lesion, occurring 7 to 10 days (up to 32 days) after a tick bite. 75 to 90% of patients with Lyme disease will develop an erythema migrans lesion, which may appear anywhere on the body, but usually at or near the site of the tick bite. In cases with a single erythema migrans lesion, the most common sites include the head and neck region, arms and legs, back, abdomen, armpits, groin, and chest.

The erythema migrans rash is often warm to the touch is variable in size, ranging from two centimetres to over 60 centimetres in diameter, and is usually in a circular pattern. The lesion must be at least 5 cm. and it usually begins as a red flat spot or bump, with an area of central clearing that becomes more apparent as the lesion expands in size. The central portion of the rash may become inflamed and lumpy. Borders, (usually bright red), may expand one centimetre per day. These borders are usually flat. Occasionally, there are multiple, alternating concentric rings of redness and central clearing, a rash pattern referred to as “bulls-eye.” The lesions sometimes are difficult to differentiate from local immune reactions to tick salivary proteins, and are sometimes confused with secondary bacterial infections. In contrast, local allergic reactions usually occur within hours of the tick bite and are very itchy. Secondary infections typically occur within a few days of the tick bite and lack the central

clearing and rapid expansion. The characteristic reddish "bull's-eye" rash (known as erythema chronicum migrans) may be seen in up to 80% of early stage Lyme disease patients, The rash does not represent an allergic reaction to the bite, but rather a skin infection with the Lyme bacteria. Patients often describe the lesion as burning, but may also report itching or pain. Children may develop fevers to 104ºF (40ºC), although low grade fevers are more common in adults. Constitutional symptoms, such as fatigue and muscle aching, may also be present. Erythema migrans fades after an average of 3 to 4 weeks (range, 1 to 14 weeks) without treatment. With antibiotics, the lesion resolves after several days and seldom comes back. Although erythema migrans lesions resolve without treatment, untreated patients are at risk of developing more severe Lyme disease. The lesions sometimes are difficult to differentiate from local immune reactions to tick salivary proteins, and are sometimes confused with secondary bacterial infections. In contrast, local allergic reactions usually occur within hours of the tick bite and are very itchy. Secondary infections typically occur within a few days of the tick bite and lack the central clearing and rapid expansion.

The disease has diverse presentations with non specific manifestations of myalgia, arthralgia, low grade fever, neck pain, flu symptoms. About 25% patients have arthritis usually of larger joints. Patients may be asymptomatic and proceed to later illness, with cardiac and neurological effects eg.meningitis, cranial nerve palsy, and central nervous system. manifestations. A post Lyme Disease Syndrome like chronic fatigue syndrome can occur.

Diagnosis and investigation

The consulting doctor or nurse has to consider tick bite infection and Lyme Disease in differential diagnosis The diagnosis is often missed and with it the opportunity for effective treatment . Borrelia bacteria, the causative agent of Lyme disease. is caused by Gram-negative spirochetal bacteria from the genus Borrelia. At least 37 Borrelia species have been described, 12 of which are Lyme related , only about 20% of persons infected with Lyme disease by the deer tick are aware of having had any tick bite, The herald patch of erythema migrans around a bite is pathognomonic .
Serological assay is the mainstay of diagnosis using ELISA (enzyme linked immune assay) which has poor specificity and the result should be confirmed by Western blotting .Only 35% of positive ELISAs are confirmed by Western blotting.(WB) There are limitations to the tests in early disease as the antibody response may be slow and can be stopped by antibiotic treatment. Western blotting testing is not entirely reliable in chronic Lyme disease. Many patients are PCR positive for Borrelia but with negative WBs. Antibodies can typically be found between two and four weeks after contracting the disease, but sometimes the antibodies do not appear for up to eight weeks. This means that people may have Lyme disease even if antibodies are not present at the very early phases, so repeat tests may be necessary in order to detect the diagnostic antibody response

Management .

If tests are positive ampicillin or doxycycline is suitable for early Lyme Disease.In late disease parenteral ceftriaxone and cefotaxime is required. Oral doxycycline (eg Vibramycin) (except in children), amoxicillin (eg Amoxil) or cephalosporin antibiotics are usual first choices.

Proving a diagnosis of chronic Lyme can be incredibly difficult and when tests are negative few physicians will diagnose Lyme. The net result is numerous patients are never given a chance to be treated.

In USA, large areas are often cordoned off to walkers because of tick infestation. American doctors treat all tick bites with antibiotics and there is an increasing tendency to do this in Britain. Fell walkers and trekkers are now presenting for prophylactic antibiotic cover before exposing themselves in endemic areas .Education of those at risk is the main priority.v-viii

Prevention

Those at risk should :

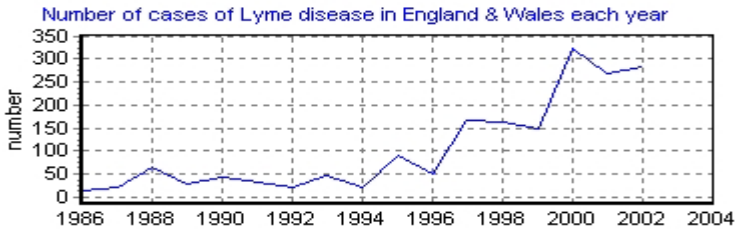
- be aware of high tick infestation areas
- Appreciate the risk is now all year round
- Take preventive measures.
- Wear clothing that covers legs and arms
- Wear below knee gaiters in an infested area
- Spray stockings and trousers with insect repellent.(eg DEET)
- Inspect the body for bites on return home.
- Remove all of the tick with forceps as soon as discovered.
- Report red patches round a bite with a clear centre to the family doctorviv.x

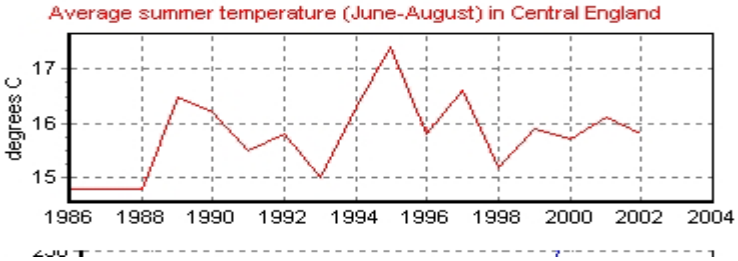
Summary.

Ticks are endemic in many parts of the world ,Europe ,UK and Scotland in particular .
Tick bites transmit infection
25% of ticks may be infected and can cause Lyme disease.
Health professionals and out door enthusiasts should be aware of the risk
Prompt removal of the tick decreases risk of infection
Antibiotics are appropriate therapy for Lyme disease.

Table One

Cases of Lyme disease in England & Wales annually, in relation to average summer temperature (June to August) in Central England. Source: Cd





[SSource Source: CDSC,[v]

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